

THE GENERA *ATAENOGERA* AND *PHYCUS* IN THE NEW WORLD
(DIPTERA: THEREVIDAE: PHYCINAE)

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Abstract. — Two of the three species names available for the New World genus *Ataenogera* Kröber are synonymized in this paper. The genus *Phycus* Walker, previously unknown from the New World, is represented here by two new species. A key to the New World species of these two genera is provided along with species descriptions and distributions. Descriptions of the pupal stage of *Ataenogera abdominalis* and of the larva and pupa of *Phycus frommeri* n. sp. are included.

Key Words: Diptera, Therevidae, *Phycus*, *Ataenogera*, New World, species descriptions, distribution

In a revisionary monograph on the Nearctic genera of Therevidae, Irwin and Lyneborg (1981) described several new genera, redescribed others, and assigned an undescribed therevid species from northwestern Mexico and southern California to the genus *Phycus*. They separated the genera *Phycus* Walker and *Ataenogera* Kröber on the basis of several morphological characteristics and suggested that species of *Ataenogera* have no close relatives in the Old World other than *Phycus*. Subsequently, Lyneborg (1983) characterized and critically evaluated the Old World species of *Phycus*.

Because *Phycus* was unknown from the New World prior to Irwin and Lyneborg's study, we undertook to compare that genus to the closely related *Ataenogera*. The species in these genera are similar in gross structure and are placed together within the subfamily Phycinae. Because *Ataenogera* and *Phycus* are clearly separated as a new clade from such New World phycine genera as *Hemicomyia* Coquillett on the one hand, and *Pherocera* Cole, *Schlingeria* Irwin, and *Parapherocera* Irwin on the other (Irwin and

Lyneborg 1981), we elected to describe and diagnose their New World species here in a single publication.

METHODS

The morphological terminology used for the male terminalia was originally defined and described by Lyneborg (1968) and subsequently modified by Lyneborg (1972, 1976, 1978) and Irwin (1977a, b); that for the female terminalia was defined and described by Irwin (1976); that for the larva and pupa follows Irwin (1972). Other morphological features are described in terminology generally accepted in the literature on Diptera. The range for each measurement and ratio is followed by the average; the range for each setal count is followed by the mode.

Each specimen was assigned a THER-EVIDAE/M. E. IRWIN/SPECIMEN number attached to the specimen. This number is used to associate the ecological and label data with a given specimen and is printed in italics in this paper. The data are incorporated into an automated data manage-

ment system originally designed by Rauch (1970).

To conserve space and include as much information as possible about each specimen, a layout adopted from Irwin (1983) is used in the "Specimens Examined" section of each species. Many of the terms used there are explained by Stuckenberg and Irwin (1973). The layout follows these typographical conventions:

1) Full capitals: LARGEST POLITICAL UNIT (country, or state within the United States).

2) Boldface type: **intermediate political unit** (state or province outside the United States or county within the United States) and **elevation** expressed in m above sea level.

3) Roman or normal print: smallest political unit (city or town) and modifier of that unit (distances in km, direction, and subunits of that unit).

4) Collector names. Acronyms were used for the following collectors: M. E. Irwin, MEI; R. M. Worley, RMW; S. I. Frommer, SIF.

5) Numbers of specimens is followed by the sex designation M for male or F for female.

6) A semicolon terminates one series of specimens and signals the beginning of the next. Data not repeated in a subsequent series are the same as those of preceding series.

Depositories.—Paratypes of *Phycus frommeri* n. sp. have been deposited in the following museums: AMNH, American Museum of Natural History, New York; ANSP, Academy of Natural Sciences, Philadelphia; ASU, Arizona State University, Tempe; AMS, Australian Museum, Sydney; BMH, Bernice P. Bishop Museum, Honolulu, Hawaii; BMNH, British Museum of Natural History, London; BYU, Brigham Young University, Provo, Utah; CAS, California Academy of Sciences, San Francisco; CIS, California Insect Survey, University of California, Berkeley; CMNH, Field Museum of Natural History, Chicago;

CMP, Carnegie Museum, Pittsburgh; CNC, Canadian National Collection, Ottawa; CSDA, California State Department of Agriculture, Sacramento; CSIRO, Commonwealth Scientific Industrial Research Organization, Canberra, Australia; CSU, Colorado State University, Fort Collins; CU, Cornell University, Ithaca; DEI, Deutsches Entomologische Institut, Berlin, East Germany; DSIR, Department of Scientific and Industrial Research, Nelson, New Zealand; DZSA, Departamento de Zoologia Agricultura, São Paulo, Brazil; EEA, Estación Experimental Agronómica, Universidad de Chile, Maipú; FSCA, Florida State Collection of Arthropods, Gainesville; IAS, Institute of Agricultural Sciences, Tokyo; IE, Istituto di Entomologia, Bologna, Italy; IML, Instituto Miguel Lillo, Tucumán, Argentina; INHS, Illinois Natural History Survey, Champaign; INIA, Instituto Nacional de Investigaciones Agrícolas, Chapingo, Mexico; IOC, Instituto Oswaldo Cruz, Rio de Janeiro, Brazil; IRSN, Institut Royal des Sciences Naturelle de Belgique, Brussels; ISU, Iowa State University, Ames; ITM, Instituto Tecnológico y de Estudios Superiores, Monterrey, Mexico; KSU, Kansas State University, Manhattan; KUF, Kyushu University, Fukuoka, Japan; LACM, Natural History Museum of Los Angeles County, Los Angeles; Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts; MEI, M. E. Irwin Collection; MHN, Museo de Historia Natural Javier Prado, Lima, Peru; MMB, Moravske Museum, Brno, Czechoslovakia; MNH, Musci Nationalis Hungarici, Budapest, Hungary; MNHN, Museum National d'Histoire Naturelle, Paris, France; MSU, Michigan State University, East Lansing; NCSU, North Carolina State University, Raleigh; NMB, Naturhistorisches Museum, Basel, Switzerland; NMP, Natal Museum, Pietermaritzburg, South Africa; NMSU, Nevada State University, Las Cruces; Nevada State Department of Agriculture, Reno; OSM, Ohio State Museum, Colum-

bus; OSU, Oregon State University, Corvallis; PAS, Polish Academy of Sciences, Warsaw, Poland; RNHL, Rijkmuseum van Natuurlijke Historie, Leiden, The Netherlands; SDAP, State Department of Agriculture, Harrisburg, Pennsylvania; SDCM, San Diego County Museum, San Diego; SJSC, San Jose State University, San Jose, California; SMN, Staatlichen Museum für Naturkunde, Stuttgart, West Germany; SWRS, Southwestern Research Station (AMNH), Portal, Arizona; TAM, Texas Agricultural and Mechanical University, College Station; UA, University of Arizona, Tucson; UAC, University of Alberta, Edmonton, Alberta, Canada; UBC, University of British Columbia, Vancouver, Canada; UCD, University of California, Davis; UCM, University of Colorado Museum, Boulder; UCR, University of California Riverside; UCVM, Universidad Central de Venezuela, Maracay, Venezuela; UG, University of Georgia, Athens; UI, University of Idaho, Moscow; UK, University of Kansas, Lawrence; UM, University of Minnesota, Saint Paul; UMA, University of Michigan, Ann Arbor; UNLP, Museo de Ciencias Naturales, Universidad Nacional de La Plata, La Plata, Argentina; USI, University of Southern Illinois, Carbondale; USNM, United States National Museum, Washington, D.C.; USSR, Zoological Institute USSR, Leningrad; USU, Utah State University, Logan; UTA, University of Texas, Austin; UTI, University of Tel Aviv, Israel; UU, University of Utah, Salt Lake City; UW, University of Wisconsin, Madison; UZM, Universitetets Zoologiske Museum, Copenhagen, Denmark; VNM, Naturhistorisches Museum Vienna, Austria; WSU, Washington State University, Pullman; ZIB, Zoologisches Institut, Berlin, West Germany; ZSI, Zoological Survey of India Collection, Calcutta, India. The paratypes of *Phycus frontalis* n. sp. are deposited in the following museums: AMNH, American Museum of Natural History, New York; INHS, Illinois Natural History Survey, Champaign;

USNM, United States National Museum, Washington, D.C.

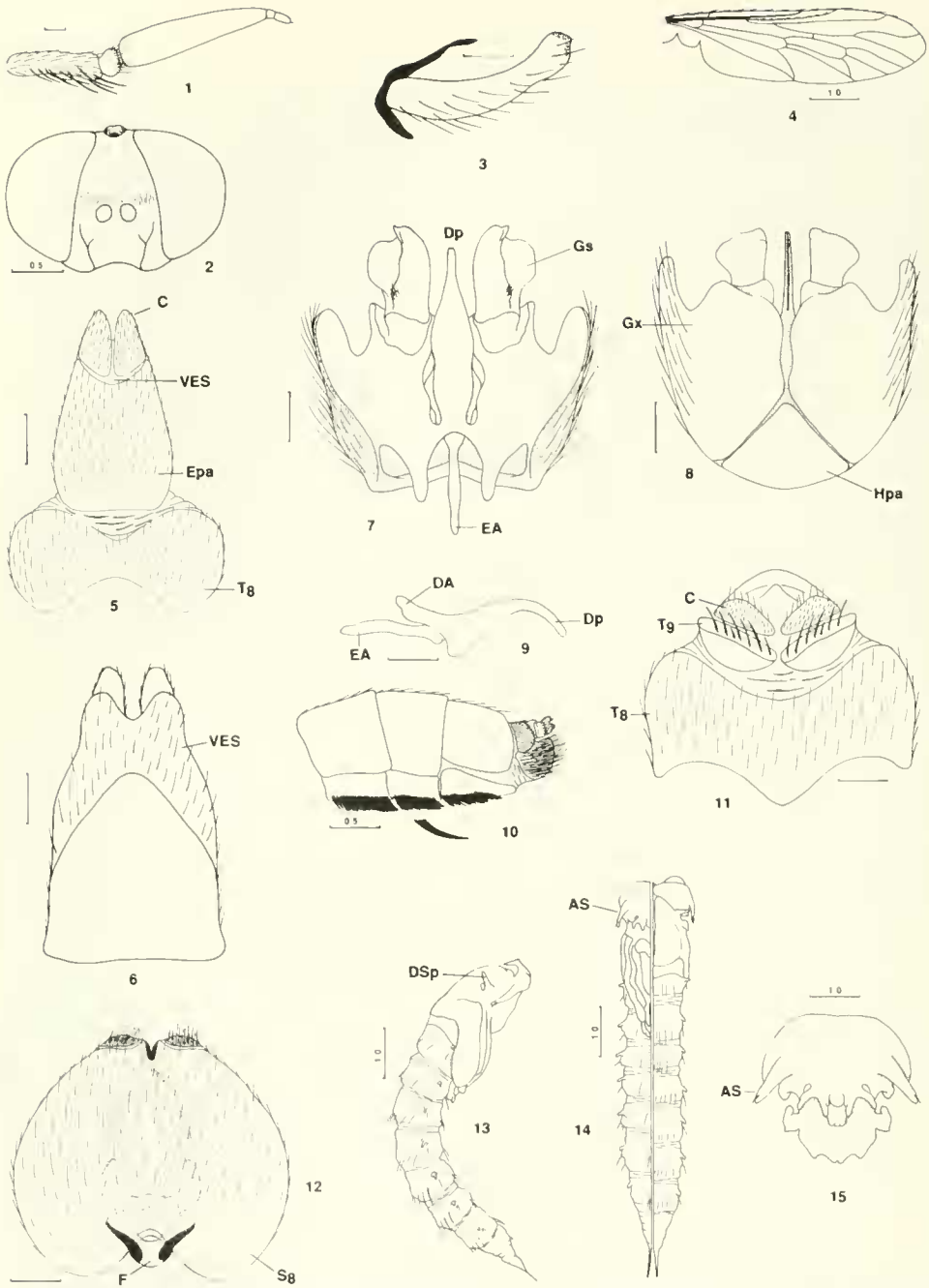
KEY TO NEW WORLD SPECIES OF
ATAENOGERA AND *PHYCUS*

1. Maxillary palpus one-segmented (Fig. 3); eye margins distinctly divergent from level of ocellar tubercle toward genae (Fig. 2); discal cell pointed basally (Fig. 4); sternites 5–8 in males, 5–7 in females (Fig. 10) with numerous lanceolate setae ventrally; male genitalia with large, subtriangular hypandrium (Fig. 8) *Ataenogera abdominalis* Kröber
- Maxillary palpus two-segmented (Fig. 18); eye margins divergent slightly from level of ocellar tubercle toward genae (Fig. 17); discal cell truncate basally (Fig. 19); sternites lacking lanceolate setae; male genitalia lacking hypandrium or much reduced. (*Phycus* Walker) 2
2. Eyes separated dorsally by distance greater than width of ocellar tubercle (Fig. 17); width of frons at level of lateral ocelli greater than 0.5 times width at level of antennal bases; posterolateral extensions of gonocoxites short, thick in ventral view (Fig. 23) *Phycus frommeri* n. sp.
- Eyes separated dorsally only by width of ocellar tubercle (Fig. 35); width of frons at level of lateral ocelli less than 0.5 times width at level of antennal bases; posterolateral extensions of gonocoxites narrow, attenuate in ventral view (Fig. 39) *Phycus frontalis* n. sp.

Superficially, the genus *Ataenogera* is morphologically similar to *Phycus*, the two genera are however quite distinct. The best distinguishing characteristics are: (a) maxillary palpus two-segmented in *Phycus*, one-segmented in *Ataenogera*; (b) fore coxae have 1–2 apical setae in *Phycus*, 4–6 apical setae in *Ataenogera*; (c) ventral epandrial sclerite fused anteriorly with epandrium in *Phycus*, fused laterally with epandrium in *Ataenogera*; (d) hypandrium extremely small or absent in *Phycus*, large in *Ataenogera*; (e) ventral apodeme of aedeagus composed of two long, narrow rods in *Phycus*, very reduced, appearing absent in *Ataenogera*.

Genus *Ataenogera* Kröber

Ataenogera Kröber (1914: 31); Malloch (1932: 255). Type species: *A. abdominalis* Kröber, by monotypy.



Figs. 1-15. *Atanogera abdominalis*. — 1. Antenna (5747). 2. Head of male, frontal view (5747). 3. Maxillary palpus, lateral view (5747). 4. Wing, dorsal view (5747). 5. Male tergite 8, epandrium, cerci, and ventral epandrial sclerite, dorsal view (5761). 6. Male ventral epandrial sclerite, ventral view (5761). 7. Male gonocoxites and gonostylus, dorsal view (5761). 8. Male gonocoxites and gonostylus, ventral view (5761). 9. Male aedeagus, lateral view (5761). 10. Female abdomen, terminal segments, lateral view with enlargement of ventral lanceolate setae (5752). 11. Female terminalia, dorsal view (5752). 12. Female terminalia, ventral view (5752). 13. Pupal exuvium lateral view (5764). 14. Pupa exuvium, ventral view (left), dorsal view (right) (5764). 15. Frontal plate (5764). Abbreviations: (AS) antennal sheath; (C) cercus; (DA) dorsal apodeme; (Dp) distiphallus; (DSp) dorsal spiracle; (EA) ejaculatory apodeme; (Epa) epandrium; (F) furca; (Gs) gonostylus; (Gx) gonocoxites; (Hpa) hypandrium; (S₈) sternite 8; (T₈) tergite 8; (T₉) tergite 9; (VES) ventral epandrial sclerite. Scale = 0.1 mm, unless otherwise indicated.

- Leptocera* Kröber (1928: 117). Type species: *L. gracilis* Kröber by monotypy. Preoccupied by Olivier (1813: 489).
- Ziehenia* Kröber (1929: January: 434). New name for *Leptocera* Kröber.
- Epileptocera* Richards (1929: August: 171). Unjustified new name for *Leptocera* Kröber.

Moderate-sized, slender flies.

Head.—Frons (Fig. 2) of both sexes at its narrowest as wide as ocellar tubercle, tomentum brownish gray; setae sparse, dorsolateral to antennal bases and in males in two lateral rows ventral to ocellar tubercle; male eyes dichoptic, eye margin diverges distinctly from level of ocellar tubercle towards gena, facets equal, setae absent; parafacial lacking setae; head slightly protrudes at antennal level; facial and genal callus absent; length of antenna 1.3–2.0 times head depth; antenna long (Fig. 1); scape cylindrical; pedicel subtriangular; flagellum elongate, tapered apically, setae absent; style terminal, two-segmented, with minute terminal spine; clypeus concave, setae absent; maxillary palpus one-segmented (Fig. 3).

Thorax.—np 2–3, sa 1, pa 1, dc 0–1, sc 1. Vittae absent; mesonotal setae moderately long, subappressed; prosternum bare in and around central depression; pleural setae elongate, scattered on propleuron and dorsal fourth of anepisternum. Wing (Fig. 4).—Ground color hyaline to pale brown, clouding apparent near apex; veins brown; pterostigma absent; setulae dorsal on R_1 ; subcostal cell and cell r_1 elongate, open; veins R_4 and R_5 subequal; cell r_4 large, encloses apex of wing, length 1.5–2.6 times width at apex; veins M_1 , M_2 , and M_3 originate separately from apical margin of discal cell; cell m_3 generally closed, petiolate; discal cell acute basally; posterior cells 5; posterior cubital cell closed with short petiole; m-cu/r-m subequal. Legs.—Fore coxae moderately long, sparsely haired, bare on posterior surface, with 4–6 stiff setae on anterior surface; femora lacking stiff setae; tibiae with several stiff apical setae.

Abdomen.—Slender, especially in male, longer than wide, laterally compressed; dorsum convex, shining fuscous to black; setae sparse, short, sternites 5–8 in males, 5–7 in females (Fig. 10) with numerous lanceolate setae ventrally. Male terminalia (Figs. 5–9).—Tergite 8 (T_8) wide, deeply constricted medially. Sternite 8 large, simple. Epandrium (Epa), longer in midline than maximum width, posterior margin broadly emarginate; cerci (C) extending posteriorly beyond epandrium and ventral epandrial sclerite; ventral epandrial sclerite, ventral view (VES) setose, attached laterally to epandrium with no membranous attachment to aedeagus, posterior margin broadly emarginate. Gonocoxites in ventral view not united ventrally, attached anteriorly by narrow membrane; hypandrium (Hpa) broad, subtriangular, large. Aedeagus with dorsal apodeme laterally attached by a strongly sclerotized bridge to basal section of paramere; distiphallus narrow, downwardly directed; ventral apodeme lacking; ejaculatory apodeme (EA) large, apical fourth expanded. Female terminalia (Figs. 11–12).—Tergite 8 (T_8) subrectangular, wider than long, posterior margin broadly concave. Tergite 9 (T_9) suboval, separated medially, with several strong setae along posterior margin. Cerci (C) subtriangular, membranous, with scattered setae. Sternite 8 (S_8) large, as long as wide, with short median emargination on posterior margin. Sternite 9 greatly modified, invaginated beneath sternite 8 to form internal furca (F).

Immature stages.—Characteristics of pupal exuvium (Figs. 13–15) in description of species.

Ataenogera abdominalis Kröber

- Ataenogera abdominalis* Kröber (1914: 31); Malloch (1932: 255).
- Leptocera gracilis* Kröber (1928: 118). New synonym.
- Henicomomyia brevicornis* Bromley (1934: 361). New synonym.

Derivation of name.—*abdomen* (Latin) = belly; *alis* (Latin) = pertaining to.

Diagnosis.—*Ataenogera abdominalis* is the only recognized species in this genus. The characteristics given in the key and description of the genus separate it from *Phycus*. Examination of the type specimens of *Ataenogera abdominalis*, *Leptocera gracilis*, and *Henicomysia brevicornis* revealed no distinctive characteristics that would justify retaining them as separate species. Some variation was noted in the color pattern of the fore and middle femora but this appears to represent clinal variation.

Description of male lectotype (5759).—Body length 8.8 mm.

Head.—Head depth 0.84 mm. Ocellar tubercle fuscous, subshiny to lightly tomentose; ocellar setae black, moderately long, scattered. Eyes fuscous. Frons fuscous, tomentum light gray, variable, with silver pile lateral to antennal bases, setae (Fig. 2) white, moderately long, dorsolateral to antennal bases and dark brown, short, in lateral row ventral to ocellar tubercle. Antenna (Fig. 1) brown, pruinosity light gray, length of antenna 1.9 times head depth; length of scape 0.40 mm, 2.9 times width, 4.0 times length of pedicel, setae dark brown, short, with several stiff setae ventrally; length of pedicel 0.10 mm, 0.7 times width, setae dark brown, in apical band; length of flagellum 1.02 mm, 5.7 times width, 2.6 times length of scape; length of basal stylomere 0.02 mm, length of apical stylomere 0.06 mm. Parafacial narrow, tomentum dense silver. Genal setae white, elongate, scattered. Maxillary palpus (Fig. 3) dark brown, pruinosity light gray, length 0.52 mm, 5.2 times width, setae white to pale yellow, elongate, scattered. Labelum black, pruinosity light gray; setae fuscous, short, scattered. Postocular setae white, elongate, abundant ventrally becoming black, short, appressed dorsally.

Thorax.—np 2, sa 1, pa 1, dc 0, sc 1. Dark brown in ground color, tomentum dark gray; setae white, moderately long, subappressed. Postpronotal lobe concolorous with thorax; setae white, moderately long, scattered. Pleuron fuscous, tomentum dense gray,

anepisternum with ventral three-fourths glossy. Pleural setae white, elongate, scattered on propleuron, scattered on dorsal fourth of anepisternum, absent on remaining pleural sclerites. Scutellum fuscous, tomentum dark gray. Postnotum and laterotergite dark brown, subshiny to pruinosity light gray; setae on laterotergite white, elongate, abundant. Wing (Fig. 4).—Length 5.7 mm, 3.8 times width. Membrane hyaline. Pterostigma dark brown, narrow. Halter dark brown. Legs.—Dark brown, tomentum dark gray, concolorous. Anterior tubercle on hind coxa round, fuscous, apical half pale yellow.

Abdomen.—Dark brown, subshiny, tergites 2–4 with narrow, white posterior margin; setae black, short, appressed on dark areas, white, moderately long on white posterior margin, sternites 5–8 with dark brown lanceolate setae (Fig. 10). Male terminalia.—Characteristics given in description of genus.

Variation in males (N = 10).—Body length 6.3–8.8, 7.9 mm. Head depth 0.60–0.84, 0.70 mm. The frons varies in having the tomentum entire to the ventral third glossy. Length of antenna 1.8–2.2, 2.0 times head depth; length of scape 0.32–0.46, 0.40 mm, 2.9–4.2, 3.6 times width, 3.2–5.3, 4.4 times length of pedicel; length of pedicel 0.08–0.10, 0.09 mm, 0.7–0.8, 0.8 times width; length of flagellum 0.74–1.02, 0.84 mm, 4.1–5.7, 4.9 times width, 1.6–2.6, 2.1 times length of scape; length of basal stylomere 0.02 mm, length of apical stylomere 0.06–0.10, 0.08 mm. Length of maxillary palpus 0.36–0.52, 0.44 mm, 5.2–7.3, 5.9 times width. Notopleural setae 2–3, 2. Dorsocentral setae 0–1, 0. Wing length 4.5–5.7, 5.0 mm, 3.5–3.8, 3.7 times width. A cline exists in the color pattern of the fore and middle femora from dark brown in specimens from Argentina, Paraguay, and southern Brazil to dark yellow in specimens from Mexico.

Female.—Similar to male with following exceptions (N = 10). Body length 7.5–8.6, 7.9 mm. Head depth 0.84–0.98, 0.92 mm.

The frons shows variation similar to male. Length of antenna 1.3–1.5, 1.4 times head depth; length of scape 0.44–0.50, 0.47 mm, 3.7–5.0, 4.2 times width, 4.8–6.0, 5.4 times length of pedicel; length of pedicel 0.08–0.10, 0.08 mm, 0.67–0.83, 0.75 times width; length of flagellum 0.70–0.72, 0.71 mm, 3.9–4.5, 4.3 times width, 1.4–1.6, 1.5 times length of scape; length of basal stylomere 0.02–0.04, 0.03 mm, length of apical stylomere 0.06–0.12, 0.08 mm. Fore and middle femora show variation similar to males. Characteristics of terminalia (Figs. 11–12) given in description of genus.

Seasonal activity.—In the specimens examined, adults were taken throughout the year with no difference in the collecting period between Central America and southern South America. Females (25) were collected 2.8 times more often than males (9).

Pupa (Figs. 13–15).—Length 8.0 mm (N = 1), width 1.5 mm. Alar process not spinose. Labial sheath broad (Fig. 15), truncate apically, not bisecting proboscis sheath. Length of antennal sheath 0.56 mm, length of subapical spine 0.08 mm. Thoracic spiracle tapered apically, apex truncate, length 0.20 mm, 2.0 times width. Posterior spines elongate, not divergent apically, length 0.44 mm. Dorsal spines on abdominal segments I–VII in transverse row on posterior third of segment. Abdominal spiracles on segments I–VII.

Type material.—A syntypic series of 3 males of *Ataenogera abdominalis* Kröber is in the Museum für Naturkunde der Humboldt-Universität zu Berlin. A male of this series, herein designated the lectotype, was collected at San Bernardino, Paraguay, in IV, by K. Fiebrig S. V. The holotype female (not male as stated in the description by Bromley 1934) of *Henicomysia brevicornis* Bromley (American Museum of Natural History) was collected at Kartabo, British Guiana, on May 2, 1924. A syntypic series of one male and one female of *Leptocera gracilis* Kröber is in the Zoologische Institut, Halle. The male of this series, herein designated the lecto-

type, was collected at Paraná, Brazil, in December.

Distribution.—The range of *Ataenogera abdominalis*, a widespread Neotropical species, extends from southern Mexico to Argentina and Uruguay.

Specimens examined (37).—ARGENTINA: **Tucumán:** Amaicha, 16-XI-1966, L. A. Stange, 1M. **Mendoza:** Potrerillos, 6-I-1927, F. and M. Edwards, 1F. **La Rioja:** La Rioja, 1928, 1F. **Catamarca:** 17 km NW Chumbicha, 1143 m, 25-XII-1971, C. A. Pearson, 1F. BOLIVIA: **Beni:** Río Itenez opposite Costa Marques, Brazil, 1–3-IX-1964, J. K. Bouseman and J. Lussenkop, 1F; 4–6-IX-1964, 1M; 30–31-VIII-1964, 1F; Río Itenez, Pampa de Meio, 11–13-IX-1964, J. K. Bouseman and J. Lussenkop, 1F. BRAZIL: **Paraná:** 1912, 1M 1F; **Pará,** Baker, 1F; **Santa Catarina:** Nova Teutonia, 27°8', 52°23', 16-XII-1947, F. Plaumann, 1M; I-1945, 1F; 27°11', 52°23', 18-XII-1959, F. Plaumann, 1F. BRITISH GUIANA: Kartabo, 20-V-1924, 1F. COSTA RICA: **Guanacaste:** La Pacifica, 4 km NW Cañas [Las Cañas], 1–9-IV-1974, P. A. Opler, 1M 4F; 29-III-1974, 1F. EL SALVADOR: Quezaltepeque, 2-XI-1977, MEI, 1F. MEXICO: **Morelos:** 11.7 km S Yautepec, 17-VIII-1962, N. L. Marston, 2F; **Puebla:** 4.8 km NW Petlalcingo, 3-IV-1962, F. D. Parker, 1F. PANAMA: **Canal Zone,** Ancon, 4-V-1926, C. T. Greene, 1F; 9-IV-1926, 1F. PARAGUAY: San Bernardino, IV, K. Fiebrig, 1M; 5-IV, 1M; -/-/-, 1M. TRINIDAD: St. Augustine, V-1959, F. D. Barrett, 1F. URUGUAY: **Minas:** Arassuahy, X-1929, Thieman, 1F. VENEZUELA: **Barinitas:** 10 km SE Barinitas, 1-III-1986, R. B. Miller, 1M.

Genus *Phycus* Walker

Phycus Walker (1850: 1); Irwin and Lyneborg (1981: 260); Lyneborg (1978: 212). Type species: *Xylophagus canescens* Walker (1848: 129) by monotypy (= *Xylophagus brunneus* Wiedemann, 1824: 19).

Caenophanes Loew (1874: 415); Lyneborg (1978: 212). Type species: *C. insignis* Loew (1874: 415) by monotypy. Preoccupied by *Caenophanes* Foerster (1862: 236).

Caenophanomyia Bezzi (1902: 191); Lyneborg (1978: 212). New name for *Caenophanes* Loew (1874: 415).

Paraphycus Becker (1923: 62); Lyneborg (1978: 212). Type species: *Phycus nitidus* Wulp (1897: 137) by original designation.

Caenophaniella Séguy (1941: 112); Lyneborg (1978: 212). Type species: *C. nigra* Séguy (1941: 112) by original designation.

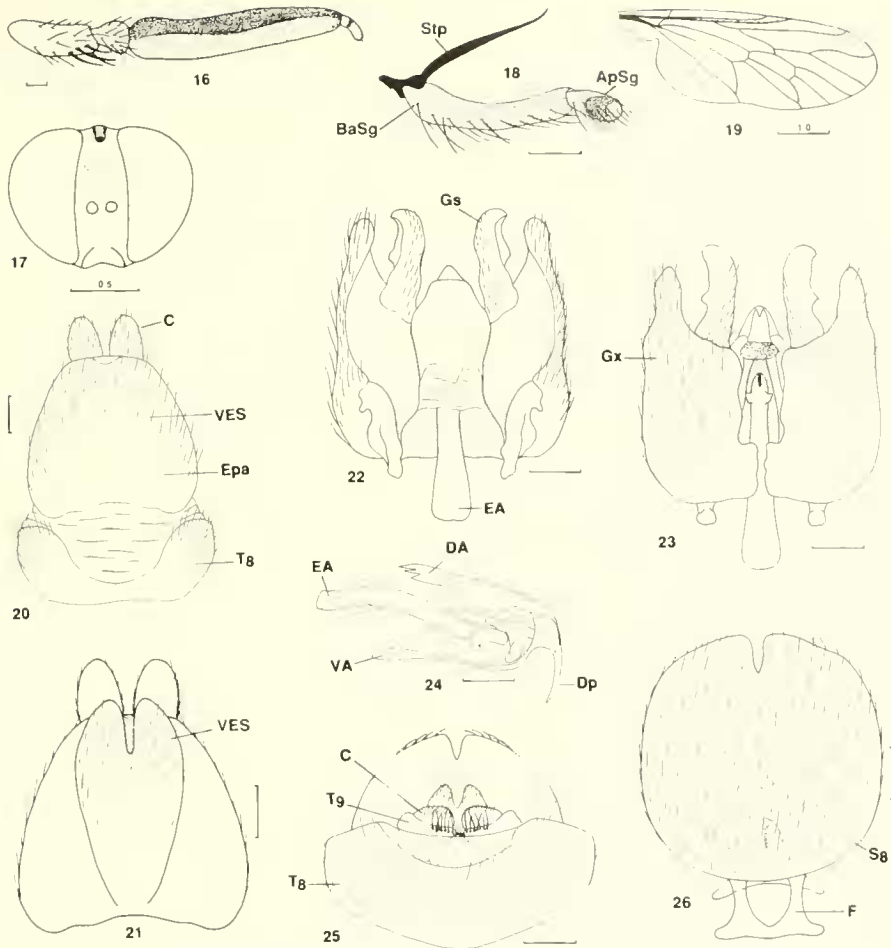
Moderate-sized, slender flies.

Head.—Frons of both sexes at its narrowest from as wide as to more than twice as wide as ocellar tubercle (Figs. 17, 35), wider in female than in male of same species, with shining black areas and tomentose areas, setae sparse, scanty, or absent; male eyes dichoptic, eye margins only slightly divergent from level of ocellar tubercle toward genae (Figs. 17, 35), facets equal, setae absent; parafacial lacking setae; head slightly to distinctly protruding at antennal level; facial and genal calli absent; antenna (Fig. 16) elongate, length 1.4–1.9 times head depth; scape cylindrical; pedicel subtriangular; flagellum elongate, tapered apically, setae absent, ratio of lengths of flagellum to scape differs greatly among species; flagellar style terminal, two-segmented, with minute terminal spine; clypeus with surface concave, setae absent; maxillary palpus two-segmented (Fig. 18), basal segment cylindrical, apical segment oval or lobate with large, apical sensory pit.

Thorax.—np 1–2, sa 1, pa 1, dc 0–1, sc 1; vittae absent; mesonotal setae short, uniform, erect; prosternum bare in and around central depression; pleural setae very short, sparse. Wing (Fig. 19).—Pterostigma absent; setulae dorsal on R_1 ; subcostal cell and cell r_1 elongate, open; veins R_4 and R_5 subequal; cell r_4 large, enclosed apex of wing,

2.2–2.6 times as long as wide at apex; cell m_3 , usually closed, petiolate; discal cell truncated basally; m-cu/r-m subequal. Legs.—Fore coxae elongate, sparsely setose, with 3 stiff apical macrosetae; middle coxae bare on posterior surface; femora without setae; tibiae with short setae.

Abdomen.—Slender, especially in male, laterally compressed toward apex; dorsum convex, shining black or reddish brown; setae sparse and short; male and female lack lanceolate setae ventrally. Male terminalia (Figs. 20–24).—Tergite 8 (T_8) comparatively wide and deeply to moderately constricted medially. Sternite 8 large and simple. Epandrium (Epa) simple, without posterior incision, may be shorter, equal, or longer in midline than maximum width; cerci (C) free, well sclerotized, extending posteriorly beyond epandrium and ventral epandrial sclerite. Ventral epandrial sclerite, ventral view (VES) large, well sclerotized, setose, extending to anterior margin of epandrium with membranous attachment to dorsal apodeme of aedeagus. Hypandrium absent in New World species. Gonocoxites (Gx) broad, heavily sclerotized; separated ventromedially. Gonostylus (Gs) large, thick, extending slightly beyond apex of gonocoxite. Aedeagus laterally attached by a strongly sclerotized bridge to midsection of paramere; distiphallus (Dp) forms a fine, downwardly directed tube; dorsal apodeme (DA) broad; ventral apodeme (VA) shaped as two elongate extensions; ejaculatory apodeme (EA) large; paramere composed of a distal process, which curves in inward and downward approaching base of gonostylus, and a stout basal apodeme. Female terminalia (Figs. 25, 26).—Tergite 8 (T_8) broad, broadly concave along posterior margin. Tergite 9 (T_9) subtriangular, separated medially with several strong setae along posterior margin. Tergite 10 bilobed, membranous. Cerci (C) membranous, simple, with scattered setae. Sternite 8 (S_8) large, as long as wide, with short median incision on pos-



Figs. 16–26. *Phycus frommeri*. —16. Antenna (5446). 17. Head of male, frontal view (5169). 18. Maxillary palpus, lateral view (5446). 19. Wing, dorsal view (5169). 20. Male tergite 8, epandrium, cerci, and ventral epandrial sclerite, dorsal view (5446). 21. Male ventral epandrial sclerite, ventral view (5446). 22. Male gonocoxites and gonostylus, dorsal view (5446). 23. Male gonocoxites and gonostylus, ventral view (5446). 24. Male aedeagus, lateral view (5446). 25. Female terminalia, dorsal view (5730). 26. Female terminalia, ventral view (5730). Abbreviations: (ApSg) apical segment; (BaSg) basal segment; (C) cercus; (DA) dorsal apodeme; (Dp) distiphallus; (EA) ejaculatory apodeme; (Epa) epandrium; (F) furca; (Gs) gonostylus; (Gx) gonocoxites; (S_v) sternite 8; (Stp) stipes; (T₈) tergite 8; (T₉) tergite 9; (T₁₀) tergite 10; (VA) ventral apodeme; (VES) ventral epandrial sclerite. Scale = 0.1 mm, unless otherwise indicated.

terior margin. Sternite 9 greatly modified, invaginated beneath sternite 8 to form internal furca (F).

Several Old World species of *Phycus* have been observed walking along dead and fallen tree trunks in riverine habitats. The New World species from western North America have been observed walking on rocks under

Washingtonia palms or other vegetation in desert canyon bottoms (Irwin, personal observation).

Phycus frommeri Webb and Irwin,
NEW SPECIES

Derivation of name: this species is named in honor of Saul I. Frommer, University of

California, Riverside, who collected most of the specimens.

Diagnosis.—*P. frommeri* can be distinguished from *P. frontalis* by the following combination of characteristics: eyes (Fig. 17) separated by a distance greater than the width of the ocellar tubercle; width of frons at level of lateral ocelli greater than 0.5 times width at level of antennal bases; posterolateral extensions of gonocoxites in ventral view (Fig. 23) short, thick.

Description of male holotype (5169).—Length (excluding antenna) 6.7 mm.

Head.—Ocellar tubercle black, tomentum light gray; ocellar setae black, short, appressed. Eyes dark brown, separated dorsally by distance greater than width of ocellar tubercle (as in Fig. 17). Frons black, tomentum light gray, converging slightly at vertex (as in Fig. 17), setae black, short, erect, in mediolateral row. Antenna (as in Fig. 16) dark brown, tomentum light gray; length of scape 0.32 mm, 2.3 times width, 2.3 times length of pedicel, setae black, scattered, erect, with several larger macrosetae ventrally; length of pedicel 0.14 mm, 1.0 times width, setae black, short, stiff; length of flagellum 0.78 mm, 4.9 times width, 2.4 times length of scape; length of basal stylomere 0.02 mm, length of apical stylomere 0.10 mm. Parafacial narrow, dark brown, tomentum silver. Genal setae white, elongate. Clypeus brown, tomentum silver. Maxillary palpus (as in Fig. 18) dark brown, tomentum silver; length of basal segment 0.34 mm, 5.4 times width, setae black, elongate; length of apical segment 0.10 mm, 1.7 times width, 0.29 times length of basal segment, setae shorter than those of basal segment. Labellum dark brown, tomentum light gray; setae along ventral margin brown, moderately long. Postocular setae white, fine, abundant ventrally becoming black, stiff, erect toward vertex.

Thorax.—Black, tomentum light silver, setae white, fine, scattered; np 2, sa 1, pa 1, dc 0, sc 1. Postpronotal lobe concolorous with thorax; setae white, fine, scattered.

Propleuron, anepisternum, katepisternum, meron dark brown, tomentum silver; anepimeron fuscous, glossy. Pleural setae white to pale yellow, abundant on propleuron, and scattered over anepisternum; absent on remaining pleural sclerites. Scutellum black, tomentum silver; setae white to pale yellow, scattered. Postnotum and laterotergite dark brown to black, tomentum silver; setae on laterotergite white to silver, elongate, abundant. Wing (as in Fig. 19).—Length 5.2 mm, width 1.8 mm, length 2.9 times width. Wing membrane hyaline with apical third pale smoky brown. Halter dark brown, tomentum light gray. Legs.—Coxae dark brown, tomentum silver; femora, tibiae and tarsi dark brown. Coxae with 3 stiff, brown apical setae.

Abdomen.—Dark brown, subshiny; setae dark brown, short, appressed with pale yellow, elongate setae laterally on tergite 1. Male terminalia (as in Figs. 20–24).—Tergite 8 (T_8) as wide as epandrium, deeply concave medially. Epandrium (Epa) as long as wide medially; cerci broad (C), rounded apically; ventral epandrial sclerite (VES), ventral view, deeply incised medially on apical margin. Gonocoxites (Gx) in dorsal view broad, heavily sclerotized; in ventral view separated medially. Gonostylus (Gs) large, thick, extending slightly beyond apex of gonocoxites.

Variation in males (N = 10).—Body length (excluding antenna) 5.7–7.3, 6.6 mm. Head depth 0.76–0.84, 0.81 mm. Length of antenna 1.5–1.9, 1.7 times head depth; length of scape 0.30–0.40, 0.34 mm, 2.3–3.0, 2.5 times width, 2.3–2.9, 2.5 length of pedicel; length of pedicel 0.12–0.14, 0.13 mm, 0.8–1.2, 1.0 times width; length of flagellum 0.76–0.92, 0.83 mm, 4.7–5.8, 5.0 times width, 1.7–2.5, 2.0 times length of scape; length of basal stylomere 0.02 mm, length of apical stylomere 0.10 mm. Length of basal segment of maxillary palpus 0.34–0.40, 0.38 mm, 4.5–5.7, 5.0 times width; length of apical segment 0.10–0.14, 0.12 m, 1.2–1.8, 1.5 times width, 0.26–0.39, 0.31 times

length of basal segment. Wing length 4.5–6.8, 4.9 mm, 2.8–3.0, 2.9 times width. Variation in the color pattern was found in one specimen (5329) where the anepisternum, anepimeron, meron, metepleuron, middle and hind coxae, and entire abdomen were pale brown and subshiny.

Female.—Similar to male with frontal setae scattered.

Female terminalia (Figs. 25, 26).—Characteristics given in description of genus.

Variation in females (N = 10).—Body length (excluding antenna) 8.2–9.6, 8.8 mm. Head depth 0.94–0.96, 0.95 mm. Length of antenna 1.4–1.6, 1.5 head depth; length of scape 0.40–0.46, 0.43 mm, 2.5–2.9, 2.7 times width, 2.0–2.9, 2.4 times length of pedicel; length of pedicel 0.16–0.20, 0.18 mm, 1.0–1.3, 1.2 times width; length of flagellum 0.68–0.80, 0.74 mm, 4.3–5.0, 4.6 times width, 1.1–1.3, 1.2 times length of scape; length of basal stylomere 0.02 mm, length of apical stylomere 0.10 mm. Length of basal segment of maxillary palpus 0.42–0.46, 0.45 mm, 5.3–5.8, 5.7 times width; length of apical segment 0.14 mm, 1.8 times width, 3.0–3.3, 3.2 times length of basal segment. Wing length 6.2–6.5, 6.4 mm, length 2.0–2.2, 2.0 times width.

Ecology.—The majority of specimens were collected in Malaise traps situated in canyon washes. Individual specimens were collected on rocks and under *Washingtonia* palms, with a single male collected on *Eriogonum fasciculatum polifolium* (5602). In the collections examined, a distinct difference was noted in the pattern between timing of adults collected in Mexico and in California. In Mexico, 92% of the adults were collected between 12 March and 5 May, while 8% were collected between 23 August and 8 November; 77% of the adults were collected during April. In California, adults were collected between 25 April and 29 July; the majority of specimens were collected between early May and mid June. Overall, males (405) were collected 1.7 times more frequently than females (243). Figure 27

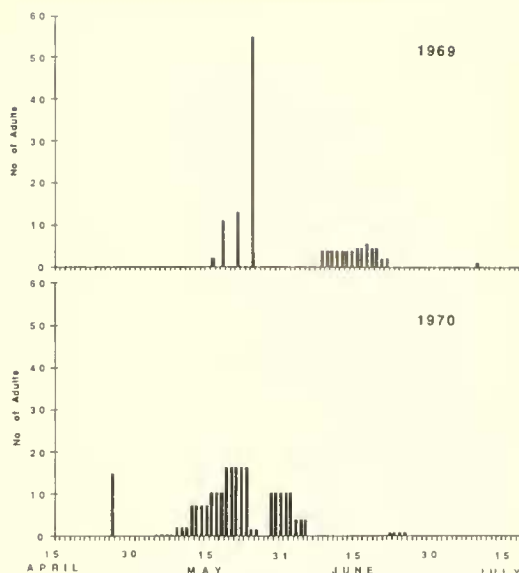
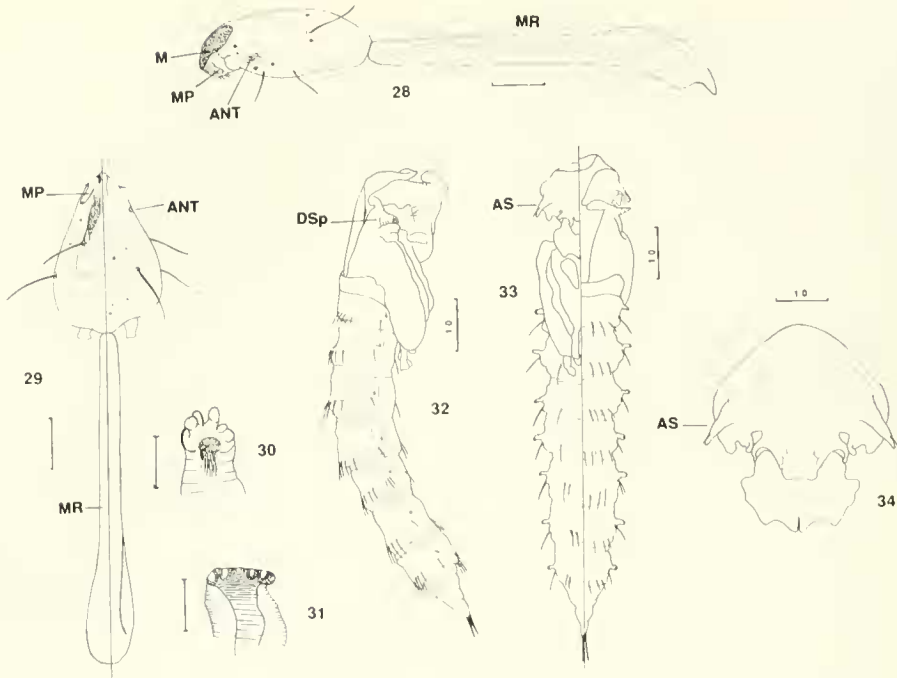


Fig. 27. *Phycus frommeri*.—Flight periodicity in Deep Canyon, Riverside County, California, in 1969 and 1970 as measured in a single Malaise trap.

shows the variation in flight periodicity at Deep Canyon, Riverside County, California, during 1969 and 1970. Two female larvae of *Phycus frommeri* were collected by R. B. Miller and L. A. Stange, one (5620) from under small conglomerates of fine soil at the base of a tree in a shaded gully and the other (5619) in loose soil under boulders, both in the state of Colima, Mexico. These were reared to adults in our laboratory.

Larva.—Head (Figs. 28–31) length 0.42 mm; metacephalic rod (MR) elongate, posterior third clavate, length 0.86 mm, 2.0 times length of head. Prothoracic spiracle (Fig. 30). Posterior spiracle (Fig. 31).

Pupa (Figs. 32–34).—Length 7.7–9.1 mm (N = 2), width 1.7–2.0 mm. Alar process not spinose. Labial sheath broad, truncate apically, not bisecting proboscis sheath. Length of antennal sheath 0.54 mm, length of subapical spine 0.14 mm. Length of thoracic spiracle 0.38 mm, tapered apically, apex truncate. Posterior spines elongate, not divergent apically, length 0.50 mm. Dorsal spines on abdominal segments I–VII and



Figs. 28–34. *Phycus frommeri* larva and pupa exuvia (5619)—28. Larval head capsule, lateral view. 29. Larval head capsule, dorsal view (right), ventral view (left). 30. Prothoracic spiracle of larva, lateral view. 31. Posterior spiracle of larva, posterior view. 32. Pupal exuvium, lateral view. 33. Pupal exuvium, dorsal view (right), ventral view (left). 34. Frontal plate of pupal exuvium. Abbreviations: (ANT) antenna; (AS) antennal sheath; (DSp) dorsal spiracle; (M) mandible; (MP) maxillary palpus; (MR) metacephalic rod. Scale = 0.1 mm, unless otherwise stated.

ventral spines on segments II–VII fine, not fused basally. Abdominal spiracles on segments I–VII moderately thick, tubular.

Distribution.—The range of *Phycus frommeri* extends from southern California to the southern tip of Baja California Sur and along the northwestern border of Sonora, Mexico southward to the state of Colima.

Specimens examined (661).—Holotype: male, Irwin specimen number 5169, CAS type no. 15741 (on permanent loan to the California Academy of Sciences from the University of California, Riverside); California, Riverside County, P. L. Boyd Desert Research Center, 3.5 mi S Palm Desert, marker #57, 18–23-V-1970, S. I. Frommer, in a Malaise trap. Paratypes as follows: UNITED STATES—CALIFORNIA: **Riverside Co.:** P. L. Boyd Desert Deep Canyon Research Center, 5.6 km S Palm Desert, 6–

13-VI-1969, SIF, 14 M 13 F; 6–8-V-1970, SIF, 1 M; 15–18-V-1970, SIF, 23 M 5 F; 18–23-V-1970, SIF, 50 M 20 F; 27-V-1-VI-1970, SIF, 35 M 15 F; 13–18-VI-1969, SIF RMW, 13 M 10 F; 18–19-VI-1969, SIF RMW, 2 M 2 F; 19–20-VI-1969, SIF RMW, 1 M 1 F; 20–24-VI-1969, SIF RMW, 4 M 1 F; 8-VII-1969, SIF RMW, 1 F; 4–6-V-1970, SIF RMW, 1 F; 26-IV-3-V-1970, SIF RMW, 1 M; 8–12-V-1970, SIF RMW, 7 M 2 F; 11–13-V-1970, SIF RMW, 5 M; 13–15-V-1970, SIF RMW, 8 M 2 F; 23–25-V-1970, SIF RMW, 16 M 18 F; 25–26-V-1970, SIF RMW, 25 M 17 F; 1–4-VI-1970, SIF RMW, 8 M 4 F; 21–29-V-1973, A. B. Tabet, 2 M; 5–13-VI-1973, A. B. Tabet, 7 M 4 F; 24-V-1969, MEI SIF, 44 M 12 F; 8-VI-1965, MEI, 1 M 1 F; 16-V-1969, MEI, 1 M 1 F; 18-V-1969, MEI, 8 M 3 F; 21-V-1969, MEI, 11 M 2 F; 13–20-VI-1973, A. B. Tabet, 5

M; 21-VI-1962, EIS, 1 F; 19-V-1964, MEI, 1 M; 11-VI-1965, MEI, 1 F; 9-16-V-1973, A. B. Tabet, 1 M; 5 mi W Sage, 3-VII-1963, P. D. Hurd, 1 F; 2-VII-1963, E. I. Schlinger, 1 F; Idyllwild, 27-VI-1956, M. S. Wasbauer, 1 M; Carrizo Creek, 30-VI-1964, E. I. Schlinger, 1 F; Massacre Canyon, 300 yds up from Highway 79, 29-VII-1964, MEI, 1 F. **San Diego Co.:** Culp Canyon, 12-VI-1958, E. I. Schlinger, 12 F; Borego, 1-V-1946, J. S. Perry, 1 M; 9.7 km E San Diego, 26-VI-1963, H. L. Griffin, 1 F, R. L. Langston, 1 F; San Vicente Res., 229 m, 16-VI-1965, MEI, 1 F. **MEXICO—Baja California Sur:** 100 km NW La Paz, Arroyo Guadalupe, **107 m**, 20-IV-1968, MEI, 2 M; 14.5 km S Loreto, 17-IV-1968, MEI, 12 M 1 F; 4.8 km E San Ignacio, **171 m**, 14-IV-1968, MEI, 1 F; 3 km E La Burrera, **515 m**, 2-3-IX-1977, J. L. Fisher and R. L. Westcott, 1 M; 2.5 km E La Burrera, **549 m**, E. M. and J. L. Fisher, 1 M; 6.4 km NW Don Pancho, 1-VIII-1964, MEI, 1 F; Las Barracas, ca. 30 km E Santiago, 25-31-III-1982, P. DeBach, 1 M; 1-6-IV-1982, P. DeBach, 2 M 1 F; 13-18-IV-1982, P. DeBach, 1 F; 19-24-IV-1982, P. DeBach, 1 M; 25-30-IV-1982, P. DeBach, 1 M; 7-12-V-1982, P. DeBach, 4 M 2 F. **Sinaloa:** 86.9 km S Culiacan, **164.6 m**, 23-IV-1969, MEI, 1 M; "Las Escondidas," 106.2 km N Mazatlán, **137 m**, 22-IV-1968, MEI, 16 M 25 F. **Colima:** Los Tempanes, 12-III-1985, R. B. Miller and L. A. Stange, 1 F reared from larva; Río Salado, 7 km S Colima, 14-III-1985, 1 F reared from larva.

Phycus frontalis Webb and Irwin,
NEW SPECIES

Derivation of name: *front* (Latin) = brow; *alis* (Latin) = pertaining to.

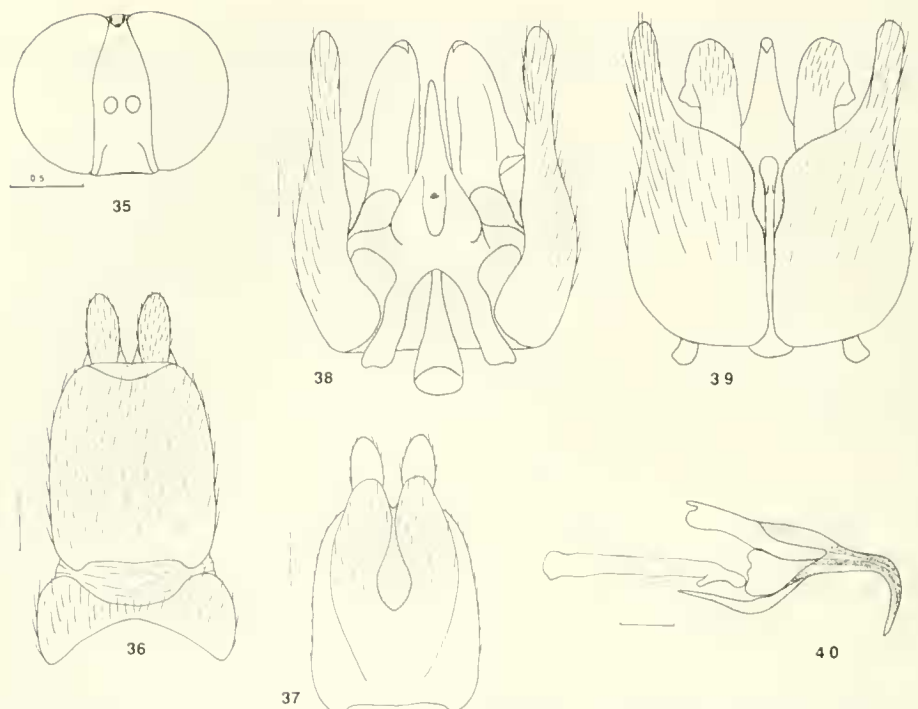
Diagnosis.—*P. frontalis* can be distinguished from *P. frommeri* by the following combination of characteristics: eyes separated dorsally only by width of ocellar tubercle (Fig. 35); frons distinctly convergent towards vertex (Fig. 35), width at level of lateral ocelli less than 0.5 times width at

level of antennal bases; posterolateral extensions of gonocoxites in ventral view narrow, attenuate (Fig. 39).

Description of male holotype (5179).—Length (excluding antenna) 6.8 mm.

Head.—Ocellar tubercle fuscous, tomentum light gray; ocellar setae fuscous, moderately long, scattered. Eyes fuscous, separated medially by distance equal to width of ocellar tubercle (Fig. 35). Frons fuscous, tomentum light gray, dense silver around antennal bases; width at level of ocellar tubercle 0.40 times width at level of antennal bases (Fig. 35); setae pale yellow, moderately long, in mediolateral row; callus absent. Antenna as in *P. frommeri* (Fig. 16), fuscous, tomentum light gray; scape, length 0.34 mm, 2.8 times width, 2.8 times length of pedicel, setae fuscous, short, subappressed with several large, stiff macrosetae ventrally; pedicel, length 0.12 mm, 1.0 times width, setae fuscous, short, suberect; flagellum, length 0.82 mm, 4.6 times width, 2.4 times length of scape; basal stylomere, length 0.04 mm, apical stylomere, length 0.10 mm, apical spine minute. Parafacial fuscous, tomentum dense silver. Genal setae white to silver, elongate, abundant. Clypeus fuscous, tomentum dense silver. Maxillary palpus as in *P. frommeri* (Fig. 18), dark brown, tomentum light gray; length of basal segment 0.34 mm, 4.3 times width, setae dark brown, moderately long, erect, on ventral surface; length of apical segment 0.14 mm, 0.41 times length of basal segment, setae sparse. Labellum dark brown, tomentum light gray; setae brown, moderately long, scattered. Postocular setae white to silver, elongate, abundant on ventral half, with numerous black, stiff setae dorsally.

Thorax.—Fuscous, tomentum light gray; setae white to silver, moderately long, scattered; np 2, sa 1, pa 1, dc 0, sc 1. Postpronotal lobe concolorous with thorax; setae white to silver, moderately long, scattered. Propleuron, anepisternum, katepisternum, meron fuscous, tomentum silver, anepimeron glossy. Pleural setae white to silver,



Figs. 35–40. *Phycus frontalis* (5180). 35. Head of male, frontal view. 36. Male epandrium, cerci, and ventral epandrial plate, dorsal view. 37. Male ventral epandrial plate, ventral view. 38. Male gonocoxites and gonostylus, dorsal view. 39. Male gonocoxites and gonostylus, ventral view. 40. Male aedeagus, lateral view. Scale = 0.1 mm, unless otherwise stated.

elongate, abundant on propleuron, scattered on anepisternum, on ventral third of katepisternum, absent on anepimeron and meron. Scutellum fuscous, tomentum light gray; setae pale yellow, moderately long, scattered. Postnotum and laterotergite fuscous, tomentum light gray; setae on laterotergite white to silver, elongate, abundant. Wing as in *P. frommeri* (Fig. 19).—Length 5.0 mm, width 1.8 mm, length 2.8 times width. Halter fuscous, tomentum light gray. Legs.—Dark brown, coxae with tomentum silver; anterior tubercle on hind coxa dark brown, apical half pale.

Abdomen.—Fuscous, subshiny; setae fuscous, short, appressed, mixed with pale yellow, elongate, suberect setae. Male Terminalia (as in Figs. 36–40).—Tergite 8 similar to *P. frommeri*. Epandrium rectangular, 1.25 times longer than wide, posterior margin truncate; cerci lobate; ventral epandrial

sclerite, ventral view, with dark brown setae. Gonocoxites in ventral view with posterolateral extension narrow, attenuate.

Variation in males (N = 2).—Body length (excluding antenna) 6.8–6.9, 6.8 mm. Head depth 0.78–0.92, 0.85 mm. Antenna, length 1.1–1.5, 1.3 times head depth; scape, length 0.32–0.34, 0.33 mm, 2.3–2.8, 2.6 times width, 2.8–3.2, 3.0 times length of pedicel; pedicel, length 0.10–0.12, 0.11 mm. Maxillary palpus, basal segment length 0.30–0.34, 0.32 mm, 3.8–4.3, 4.1 times width; apical segment length 0.10–0.14, 0.12 mm, 1.3–1.8, 1.6 times width, 0.33–0.41, 0.37 times length of basal segment. Wing length 5.0–5.5, 5.3 mm, 2.8–3.1, 3.0 times width.

Female.—Similar to male. Female Terminalia.—As in *P. frommeri* (Figs. 25, 26).

Variation in females (N = 2).—Body length (excluding antenna) 7.4 mm. Head depth 1.10–1.18, 1.14 mm. Antenna length

1.4 times head depth; scape, length 0.41–0.44, 0.43 mm, 2.6–2.8, 2.7 times width, 2.4–3.0, 2.7 times length of pedicel; pedicel, length 0.14–0.18, 0.16 mm, 0.8–1.0, 0.9 times width; flagellum, length 0.84 mm, 4.7 times width, 2.0 times length of scape; basal stylomere length 0.04 mm, apical stylomere length 0.10 mm. Maxillary palpus, basal segment length 0.40–0.52, 0.46 mm, 5.0–5.2, 5.1 times width; apical segment length 0.16–0.20, 0.18 mm, 1.4–2.0, 1.6 times width; 0.38–0.40, 0.39 times length of basal segment. Wing length 6.7–7.7, 7.2 mm, 3.0–3.1, 3.15 times width.

Distribution.—The range of *Phycus frontalis* extends from Yucatán, Mexico to Costa Rica.

Specimens examined (4).—Holotype: male, Irwin specimen number 5179 (AMNH), Mexico, Yucatán, Chichén Itzá, VI-29. Paratypes as follows: MEXICO—Yucatán: Chichén Itzá, VI-1929, 1 M 1 F. COSTA RICA—La Suiza, 1924, P. Schild, 1 F.

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ogisches Institut, Halle, Professor Hüsing; Zoologisches Museum aus der Humboldt-Universität zu Berlin, H. Schumann.

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